REMARKS

Claims 1, 3, 5, 6, and 8-14 are active in the application. Independent claims 1, 3, 6, 9, and 13 have been amended to include the features of dependent claims 2, 4, and 7 and require that the time rate of voltage drop (e.g., dv/dt) be used to determine when discharge of the cell is terminated. None of the references of record teach or suggest this feature of the present invention.

Claim 11 is patentable as filed because it includes a switch for connecting the cell to either the output terminal or to a step-up DC-DC converter.

The specification has been amended in several locations to correct grammatical errors. No new matter has been added.

Claim 1 was rejected under 35 USC 102(b) as being anticipated by US patent 5,990,664 to Rahman. Claims 3, 5, 6, and 8 were rejected under 35 USC 102(b) as being anticipated by US Patent 6,414,403 to Kitagawa. Claims 2, 4, and 6 (possibly meant to be 7) were rejected under 35 USC 103(a) as being unpatentable over Rahman and Kitagawa in view of US Patent 5,998,974 to Sado. Claims 2, 4 and 7 have been cancelled, and the limitations of these claims have been incorporated into independent claims 1, 3, 6, 9, and 13. Claim 9 was rejected as being obvious over U.S. Patent Publication 2003/0030413 to Saeki in view of U.S. Patent 5,990,664 to Rahman. Claims 10, 12, and 14 have been rejected as being obvious over a combination of Saeki, Rahman and U.S. Patent 6,163,131 to Garstein. Each of these rejections are traversed

The present invention provides a circuit for stabilizing the discharge of a cell (i.e., battery). In an embodiment of the invention now recited in independent claims 1, 3, 6, 9, and 13 as amended, the time rate of voltage drop (e.g., time derivative of voltage, dv/dt) is measured and used to determine when the discharge of the cell is terminated. This aspect of the invention is illustrated in Fig. 3, and is described on page 16, lines 3-15 of the specification. This aspect of the present invention provides more reliable and accurate detection of cell discharge. This is because the time rate of voltage change will tend to increase in magnitude rapidly as the cell nears a completely discharged state, as illustrated in Fig. 3. Hence, the discharged state can be detected by monitoring for when dv/dt rapidly becomes increasingly negative.

The Office Action argues that Sado teaches that a voltage drop per unit time is used to determine the overdischarge level of a battery (i.e. cell), specifically at col. 17, lines 34-60. This is wrong. Sado teaches a voltage threshold, not a rate of voltage change per unit time. Specifically, in column 17, Sado teaches a specific voltage level threshold for detecting battery overdischarge. Sado does not teach or suggest a rate of voltage discharge or, equivalently, a voltage drop per unit time for determining when a battery is overdischarged or nearing charge depletion. Also, none of the other references of record teach that a rate of voltage drop or voltage drop per unit time can be used to determine or detect battery discharge. Accordingly, the rejections of original claims 2, 4, and 7 are erroneous, and claims 1, 3, 6, 9, and 13 are patentable as amended over any combination of references of record.

Claims 11 and 13 were rejected under 35 USC 103(a) as being unpatentable over Kitagawa in view of Saeki. The rejection of claim 11 is in error. Claim 13 is not obvious for the reasons set forth above.

Specifically, claim 11 requires a "switching circuit to switch a positive electrode of said cell to either of an output terminal of said power source circuit or an inputting section of said step-up DC-DC converter". Hence, the switch required in claim 11 toggles the cell between the output terminal or the DC-DC converter. The switch is necessarily separate from the DC-DC converter. Fig. 1 of the present application shows the switch 5 recited in claim 11. Clearly, the switch 5 can toggle the cell to be connected to either the step-up DC-DC converter 7, or the output terminal 10. Claim 11 as written requires this functionality.

The Office Action argues that Fig. 1, item 4 of Kitagawa teaches a switch according to claim 11, i.e., with "converter-output toggle" functionality. This is wrong. The switches in the converter 4 of Kitagawa are switches used for DC-DC conversion. The switches of Kitagawa are part of the DC-DC converter, and are not capable of toggling the cell between the output terminal and the DC-DC converter, as required by claim 11. The switches of Kitagawa cannot possibly "switch a positive electrode of said cell to either of an output terminal of said power source circuit or an inputting section of said step-up DC-DC converter", as required by claim 11.

Also, it is noted that none of the other cited references teach or suggest a switch that can toggle a cell between an output terminal and a DC-DC step-up converter.

Accordingly, the rejection of claim 11 is erroneous and must be withdrawn.

In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 1, 3, 5, 6, and 8-14 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees for the petition or for entry of this amendment to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson P.C.).

Respectfully submitted,

Michael E. Whitham
Reg. No. 32,635

Whitham, Curtis, & Christofferson, P.C.
11491 Sunset Hills Road, Suite 340
Reston, VA, 20190
Phone: 703-787-9400
Fax: 703-787-7557